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SAFETY AND MISSION ASSURANCE REQUIREMENTS AND PROCESSES FOR HUMAN SPACE FLIGHT

Responsible Office: Q/Office of Safety and Mission Assurance

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Safety and Mission Assurance Requirements and Processes for Human Space Flight

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PREFACE

P.1 PURPOSE

The overarching goal of the Human Space Flight (HSF) Safety and Mission Assurance (SMA) community processes is to protect the public, astronauts and pilots, NASA workforce, and high-value equipment and property. This document outlines the requirements, roles, and responsibilities of the HSF SMA community in assuring the safety and mission success of human space flight programs.

P.2 APPLICABILITY

a. This NASA Procedures and Guidelines (NPG) is applicable to NASA Headquarters and NASA Centers, including Component Facilities and to the Jet Propulsion Laboratory to the extent specified in the contract.

b. This document provides the basic processes and requirements for assessing and confirming satisfactory completion of all SMA activities necessary to provide an acceptable level of confidence in the safety and mission success of human space flight missions. It shall be used specifically for individual Space Shuttle and International Space Station (ISS) missions, and for missions involving both programs.

P.3 AUTHORITY

a. 42 U.S.C. 2473(c)(1), Section 203(c)(1) of the National Aeronautics and Space Act of 1958, as amended.

b. NPD 8700.1, "NASA Policy for Safety and Mission Success."

P.4 REFERENCES

a. Presidential Directive / National Security Council Memorandum Number 25 (PD/NSC-25), "Scientific or Technological Experiments with Possible Large-Scale Adverse Environmental Effects and Launch of Nuclear Systems into Space"

b. NPD 1000.1, "Strategic Plan."

c. NPD 7120.4, "Program/Project Management."

d. NPD 8621.1, "NASA Mishap Reporting and Investigating Policy."

e. NPD 8700.1, "NASA Policy for Safety and Mission Success"

f. NPD 8710.3, "NASA Policy for Limiting Orbital Debris Generation."

g. NPD 8720.1, "NASA Reliability and Maintainability (R&M) Program Policy."

h. NPD 8730.4, “Software Independent Verification and Validation (IV&V) Policy.”

i. NPG 1000.2, “Strategic Management Handbook.”

j. NPG 1000.3, “The NASA Organization.”

k. NPG 7120.5, “Program and Project Management Processes and Requirements.”

l. NPG 7120.xx, “Surveillance Program.”

m. NPG 8621.1, “NASA Mishap Reporting and Investigating Policy”

n. NPG 8705.xx, “Human Rating Procedures and Guidelines.”

o. NPG 8705.xx “Probabilistic Risk Assessment Policy”

p. NPG 8705.xx, “Risk Management Procedures and Guidelines.”

q. NPG 8715.3, “NASA Safety Manual.”

r. NPG 8735.xx, “Software Independent Verification and Validation (IV&V) Management.”

s. NPG 8735.xx, “Supplier Assessment.”

t. NASA HQ Office Work Instruction 8700-Q005, “Development and Use of Annual Operating Agreements.”

u. NASA HQ Office Work Instruction 8700-Q006, “Manage SMA Process Verifications.”

v. NASA HQ Office Work Instruction 8715-Q034, “Manage OSMA Contingency Action Operations Center (Shuttle).”

w. KHB 1700.7, “Space Shuttle Ground Safety Handbook.”

x. NSTS 07700, Volume VIII, “Space Shuttle Operations.”

y. NSTS 07700, Volume VIII: “Space Shuttle Program, Flight Definition and Requirements Directive.”

z. NSTS 08117, “Requirements and Procedures for Certification of Flight Readiness.”

aa. NSTS 1700.7, “Safety Policy and Requirements for Payloads Using the Space Transportation System.”

ab. NSTS/ISS 13830, “Payload Safety Review and Data Submittal Requirements.”

ac. SSP 30223, “Problem Reporting and Corrective Action for the Space Station Program.”

ad. SSP 30324, “Instructions for the Preparation of Failure Modes and Effects Analysis and Critical Items List for the Space Station.”

ae. SSP 30309, “Safety Analysis and Risk Assessment Requirements.”

af. SSP 30599, “Safety Review Process Document.”

ag. SSP 30695, “Acceptance Data Package Requirements.”

ah. SSP 50004, “Support Equipment Design Requirements.”

ai. SSP 50021, “Safety Requirements Document.”

aj. SSP 50035, “Computer Based Control System for Safety Requirements Documents.”

ak. SSP 50108, “Certificate of Flight Readiness Process Document.”

al. SSP 50134, “ISS Programs Risk Blue Card.”

am. SSP 50190, “International Space Station Program Contingency Action Plan for JSC.”

an. SSP 50200-1, Volume I, section 3.4, "Safety and Mission Assurance/Program Risk."

an. SSP 50200-09, Volume IX, section 12.0, "Safety and Mission Assurance/On-Orbit Operations Support."

ao. SSP 50231, “Safety and Mission Assurance Certificate of Flight Readiness Implementation Plan.”

ap. ISSP-PPD-507, “Partner Program Directive, Charter for International Space Station Mission Management Team.”

P.5 CANCELLATION
None.

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CHAPTER 1: Overview

1.1 Introduction

1.1.1 The Human Space Flight (HSF) Safety and Mission Assurance (SMA) community is an active stakeholder in the safe and successful performance of human space flight activities. NASA's Core Value (NPD 1000.1) of "Protecting the Public, Astronauts and Pilots, NASA Workforce, High-Value Equipment and Property" is of vital importance in all HSF activities. The Office of Safety and Mission Assurance (OSMA) leads the effort and provides oversight and independent assessment to the programs and projects of the Human Exploration and Development of Space (HEDS) Enterprise to meet this Core Value. The SMA community provides critical in-line (NASA/contractor) safety, reliability, and quality products and services directly to the HSF programs and projects. These products and services are primarily the results of SMA studies, analyses, and risk assessments and provide the basis for SMA and program/project decisions. In addition to in-line products and services, other necessary inputs to formulate SMA decisions include: program/project contractor surveillance, oversight of SMA processes, and independent technical assessments.

1.1.2 For each HSF mission, the SMA community provides input and recommendations through the SMA flight readiness process to support the formal Certification of Flight Readiness (CoFR) process. The Associate Administrator for Safety and Mission Assurance has the responsibility to ensure that NASA protects the public, our astronauts, the NASA workforce, and high-value equipment and property in accordance with SMA policy. To ensure top management visibility in the SMA processes, numerous OSMA sponsored activities are established to provide the SMA community an opportunity to assess safety and risk management of the HSF programs, and provide visibility into potential future HSF issues.

1.2 Purpose

This NPG describes the SMA processes, requirements, roles, and responsibilities for HSF. It also describes the process to be used by NASA SMA officials to assure compliance with SMA requirements. The Associate Administrator for Safety and Mission Assurance uses the SMA processes as defined in this NPG to obtain the knowledge and information needed to support granting of SMA Flight Certification and concurring in the HSF CoFR processes.

> ⇒ **NOTE:** NPG addresses requirements processes that are to be implemented by any HSF program. Commit-to-flight is still emphasized in NPG with ISS and SSP included as subparagraphs. OSMA processes needed to provide insight are defined.

1.3 Scope

1.3.1 This document is limited in scope to the description of the requirements and processes used by the SMA community to address HSF program issues and concerns affecting the safety of the public, astronauts, workforce and high-valued equipment and property. The OSMA processes used to provide oversight into the health, stability and issues relevant to the safety and mission success of HSF and

have a direct interface with the Office of Safety and Mission Assurance (OSMA) are addressed in this document, including the formal Certification of Flight Readiness (CoFR) process, HEDS Assurance Board (HAB), Process Verification (PV), Annual Operating Agreement (AOA), Independent Assessment, and the SMA processes supporting the launch, mission execution, and recovery activities. This document addresses these activities as they apply specifically to the Space Shuttle and the International Space Station (ISS) programs as well as future HSF programs and projects.

This includes but is not limited to:

a. Space Transportation Systems,
   - Earth to Orbit (ETO),
   - Beyond Earth Orbit Vehicles (BEO),
   - Crew Return Vehicles (CRV),
   - Crew Transfer Vehicles (CTV).

b. Space Stations,

c. Planetary Surface Systems (PSS)

⇒ NOTE: This mirrors the scope of the Human Rating Document.

1.3.2 HSF SMA community decisions are based on risk assessments, independent studies and analyses, validation efforts, audits, completion of required work, and surveillance of SMA efforts. The HSF SMA community assures that all flight and ground safety requirements have been satisfied and that issues and concerns that potentially could have an adverse effect on the minimum mission success criteria have been appropriately dispositioned.

1.3.3 This document is not a direct instruction to NASA contractors unless so stated in their respective contract.

1.4 Functional Responsibilities

Achieving a world-class safety and mission success record for the HSF programs cannot be done by one person, one office or through one review. It is a process that demands diligence and teamwork from personnel and functions across the Agency. HSF SMA along with HSF programs are responsible for developing and implementing policies, processes, procedures, and requirements necessary to ensure successful implementation of the requirements in this document. The implementation responsibilities include the following professionals:

⇒ NOTE: Those responsibilities that are necessary to implement SMA requirements are listed followed by a table to show the distribution of responsibilities.

1.4.1 Associate Administrator for Safety and Mission Assurance

The Associate Administrator for Safety and Mission Assurance is responsible for achieving the objectives defined in NPD 8700.1, "NASA Policy for Safety and Mission Success," related to oversight, independent assessment, technical review and evaluation, and ensuring that effective and efficient functional management is in place to enhance the potential for success of NASA programs, projects and operations. Additionally, the OSMA will review these practices periodically to ensure that they are inclusive, complete and appropriately applied.

To accomplish this, the Associate Administrator for Safety and Mission Assurance is specifically responsible to:

a. Lead the development of policy, requirements, standards, and guidance for SMA and serves as functional leader for Agency-wide SMA.

b. Provide the NASA Administrator, Associate Administrator for Space Flight, Lead Center Director, and HSF Program/Project Managers with an independent assessment of readiness for major development, test, launch, and on-orbit activities.

c. Chair the HEDS Assurance Board (HAB) (See Appendix B) and provide direct input on programmatic safety and mission integrity to both the Associate Administrator for Space Flight and the NASA Administrator.

d. Participate as a member of the Flight Readiness Review Board chaired by the Associate Administrator for Space Flight.

⇒ Ref: NPD 8700.1, para 5.c.5

e. Chair the SMA Prelaunch Assessment Review (PAR) process (see Appendix C) to assess the safety and operational readiness of flight hardware/software, mission critical support equipment, hazardous facilities/operations, and high energy ground-based systems.

⇒ Ref: NPD 8700.1, para 5.c.4

f. Ensure that effective and efficient SMA functional management processes are in place to assure safety and enhance the potential for success of NASA programs/projects and operations. This includes establishing, approving, and maintaining the HEDS Enterprise SMA agreement; reviewing and concurring in each Center SMA Annual Operating Agreement; conducting biennial SMA process verifications; providing SMA input to performance plans and annual performance evaluations for Enterprise Associate Administrators, Center Directors, and Center SMA functional managers.

⇒ Ref: NPD 8700.1, para 5.c.1

g. Direct and oversee the prompt and accurate reporting, investigating, and analyzing of all NASA mishaps and close calls, and the closure of problems, nonconformances, and anomalies. Assure the collection, retention, and communication of their lessons learned.

⇒ Ref: NPD 8700.1, para 5.c.7

h. Ensure the SMA support of program/project operations (see Appendix D) and special SMA interfaces (see Appendix E).

i. Terminate any operation that presents an immediate and unacceptable risk to personnel, property, or mission operations.

1.4.2 Associate Administrator for Space Flight

The Associate Administrator for Space Flight is the senior manager for all HSF projects and programs and is ultimately responsible for the safety and mission success of all HSF missions. To accomplish this, the Associate Administrator for Space Flight shall:

a. Provide executive leadership in implementing Agency SMA and risk policies, plans, techniques, procedures, and standards for all HSF activities and program/projects.

⇒ Ref: NPD 8700.1, para 5.b.1

b. Ensure that safety and mission success requirements are defined for all HSF programs/projects.

⇒ Ref: NPD 8700.1, para 5.b.2

c. Establish/direct the formal reviews for the flight certification of HSF program/project and operations.

⇒ Ref: NPD 8700.1, para 5.b.3

d. Approve, in coordination with the Associate Administrator for Safety and Mission Assurance, the Enterprise's SMA Agreement.

⇒ Ref: NPD 8700.1, para 5.b.4

e. Designate an HEDS Enterprise SMA point of contact.

⇒ Ref: NPD 8700.1, para 5.b.5

f. Serve as the final risk acceptance/disposition official for Enterprise activities.

⇒ Ref: NPD 8700.1, para 5.b.6

g. Report status of Enterprise SMA expectations to the Administrator on an annual basis.

⇒ Ref: NPD 8700.1, para 5.b.7

h. Implement proper mishap reporting and investigation process.

⇒ Ref: NPG 8621

i. Terminate any operation that presents an immediate and unacceptable risk to personnel, property, or mission operations.

1.4.3 HSF Center Directors

The HSF Center Director is responsible for the safety and mission success of Center activities and operations related to HSF program/projects. To accomplish this, the HSF Center Director with the Center SMA/SH&IA Director shall:

a. Maintain the safe and successful operation of facilities and physical plants.

b. Use and distribute lessons learned to improve operations and minimize the probability and severity of mishaps.

c. Implement Agency SMA policies, plans, techniques, procedures, and standards, and ensure that safety and mission success requirements are established for Center operations and activities.

d. Approve the Center's SMA Annual Operating Agreement.

e. Staff Center organizations with qualified SMA personnel at the level appropriate to meet assigned responsibilities.

f. Serve as the final risk acceptance/disposition official for Center activities.

g. Terminate any operation that presents an immediate and unacceptable risk to personnel, property, or mission operations.

1.4.4 HEDS SMA Independent Assurance (IA) Director

The HEDS SMA IA Director is responsible for evaluating through objective analysis of selected program processes and products, the technical adequacy of HSF programs and the capability to safely achieve mission success while minimizing risk. To accomplish this, the HEDS SMA IA Director shall:

a. Enhance the safety and quality of HSF programs and missions by assessing the degree to which safety, reliability, maintainability and quality assurance (SRM&QA) disciplines are appropriately applied throughout the program/project life-cycle.

b. Obtain insight through independent assessment of select human space flight ground and flight operations to assure suitable attention to risk management, safety, and mission success.

c. Advise NASA management on significant human space flight safety and mission assurance issues discovered or addressed by HEDS SMA IA.

d. Terminate any operation that presents an immediate and unacceptable risk to personnel, property, or mission operations.

1.4.5 HSF Program/Project Managers

HSF Program/Project Managers are responsible for the safety and mission success of their programs/projects. To accomplish this, they shall:

a. Implement Agency and Center SMA policies, guidelines, and standards, and establish safety and mission success requirements within their programs/projects.

b. Develop, in conjunction with the responsible SMA functional managers, the program/project risk management plans, establish/maintain a mission risk profile; and serve as the final risk acceptance/disposition official for activities within their programs/projects.

c. Designate an individual with specific responsibilities for coordinating/executing SMA efforts within the programs/projects.

d. Compile, use and distribute lessons learned to improve the likelihood of mission success.

e. Terminate any operation that presents an immediate and unacceptable risk to personnel, property, or mission operations.

1.4.6 HSF Program SMA Functional Managers

The HSF Program SMA functional managers are responsible for implementing the program/project SMA plan. To accomplish this, they shall:

a. Provide SMA leadership and policy implementation direction for HSF programs/projects and operations.

b. Serve as the HSF focal point for the alternative, independent SMA line of communication.

c. Formulate the program/project input into the Center SMA AOA.

d. Provide SMA products and services in accordance with the applicable SMA AOA.

e. Review, in coordination with program/project personnel, SMA and risk management plans.

f. Conduct surveillance and assessments to enhance likelihood of success of the program/project and operations, and effectiveness of SMA activities.

g. Terminate any operation that presents an immediate and unacceptable risk to personnel, property, or mission operations.

h. Assure effective and efficient SMA processes are in place to enhance the likelihood of success.

i. Assure prompt and accurate reporting, investigating, tracking, and closure of all mishaps, close calls, problems, nonconformances and anomalies within the program/project jurisdiction. This

includes performing collection, retention, and distribution of lessons learned as a means of recurrence control.

j. Verify ongoing implementation of SMA process requirements throughout HSF program design, development, manufacturing and operation.

1.4.7 OSMA HSF Program Manager

The OSMA HSF Program Manager assures compliance with NASA SMA policy, requirements, and guidelines as applied to HSF programs and projects. This OSMA SMA oversight function provides a means to identify, define, and assess significant ground and flight safety issues to provide NASA senior management with an understanding of risks, safety concerns, reliability, and quality problems. Additionally, the OSMA HSF Manager focuses on activities and processes that defend against requirement changes that may impact safety and mission success. To accomplish this, the OSMA HSF Program Manager shall:

a. Organize and lead special teams of government and contractor experts to assess the safety and integrity of HSF program plans, policies, guidelines, and procedures.

⇒ Ref: NASA HQ HOWI 8700-Q006

b. Perform Executive Secretary responsibilities for HAB.

c. Participate as a member of safety reviews, design reviews, flight readiness reviews, operational readiness reviews, and flight acceptance readiness reviews.

d. Assure proper performance of a Prelaunch Assessment Review per the process defined in Appendix C.

e. Provide an OSMA point of contact with HEDS Centers and contractors for human space flight programs and projects.

f. Provide review of HSF related NASA Safety Reporting System (NSRS) reports and submit recommendations to OSMA management on acceptance/resolution.

g. Assure each Center SMA function has completed an Annual Operating Agreement with the Center Director on the activities to be performed.

⇒ Ref: NASA HQ HOWI 8700-Q005

1.5 Roles and Responsibilities

Table 1 delineates the roles and responsibilities of key organizations in implementing the SMA management processes for HSF as defined by the Agency Policy requirements in NPD 8700.1, "NASA Policy for Safety and Mission Success" and NPG 7120.5, "Program and Project Management Processes and Requirements." It is the responsibility of the HEDS Enterprise and the program/project

manager to determine the level of support activity needed and to establish agreements with other NASA Centers, Federal agencies, and/or contractors to accomplish these roles.

NOTE: The managers listed in Table 1 are responsible for ensuring that the necessary work is assigned and carried out to the level indicated in the table.

Table 1. Roles and Responsibilities for SMA Management Process

Function	Associate Administrator for Safety and Mission Assurance	Associate Administrator for Space Flight	HSF Center Director and Center SMA/SH&IA Director	HEDS SMA Independent Assurance Director	HSF Program/ Project Manager	HSF Program/ Project SMA Functional Manager	OSMA HSF Program Manager
Establish Agency SMA policies, procedures and guidelines, and standards (NPD 8700.1)	Lead	Implement	Verify	Verify			Support and Verify
Implement Agency SMA policies, procedures and guidelines, and standards. (NPD 8700.1, 5.b.1)		Lead	Support		Implement	Support	Verify
Develop Flight Certification process for each HSF program/project (NPD 8700.1, 5.b.3)	Support	Lead (Enterprise process)	Lead (Center process)		Lead (Program process)	Support	Verify
Acceptance of residual risk (NPD 8700.1, 5.b.6)	Support	Lead & Coordinate with OSMA			Support		Support
Establish, approve and maintain Enterprise SMA Agreement (NPD 8700.1, 5.c.1)	Participate	Lead	Support		Support		
Implement Annual Operating Agreement Process (NPD 8700.1, 5.c.1)	Support	Lead	Implement (HSF SMA Director)		Support	Implement	Verify
Conduct Biennial process verification (NPD 8700.1, 5.c.1)	Lead	Participate	Support				Participate
Conduct PAR or equivalent to verify implementation of SMA processes (NPD 8700.1, 5.c.4)	Lead			Support		Support	Support

Function	Associate Administrator for Safety and Mission Assurance	Associate Administrator for Space Flight	HSF Center Director and Center SMA/SH&IA Director	HEDS SMA Independent Assurance Director	HSF Program/ Project Manager	HSF Program/ Project SMA Functional Manager	OSMA HSF Program Manager
Implement Mishap Reporting Process (NPD 8700.1, 5.c.7)	Support	Lead & Coordinate with OSMA	Support		Support	Support	Verify
Develop SMA program/project plan (NPG 7120.5)					Lead	Support	Verify
Develop and Implement Lessons Learned Process (NPD 7120.5)					Lead	Support	Verify
Apply Risk Management Principles for HSF programs/projects (NPG 7120.5)				Participate	Lead	Support	Verify
Support SMA Special Interfaces (NPG 8715.3 Chapter 5)	Support	Lead			Support	Support	Verify
Conduct HEDS Assurance Board (Appendix B)	Lead			Support		Support	Implement and Support
Perform Mission Management Function (Appendix D)					Lead	Support	Verify

Table 1 Terms:

Lead: Responsible for line item actions.
Support: Assist the lead in performing and accomplishing.
Participants: Awareness of program/status issues and status.
Verify: Provide oversight and insight to ensure accomplishment and to ensure that policies and procedures have been implemented.
Implement: Actionee for policy and procedures.

***** Table 1½. Roles and Responsibilities for SMA Management Process *****
These elements are CURRENTLY in NPD 8700.1 and may be removed with the UPDATE to NPD 8700.1

Function	Associate Administrator for Safety and Mission Assurance	Associate Administrator for Space Flight	HSF Center Director and Center SMA/SH&IA Director	HEDS SMA Independent Assurance Director	HSF Program/ Project Manager	HSF Program/ Project SMA Functional Manager	OSMA HSF Program Manager
Establish and maintain independent lines of communications (NPD 8700.1, 1.d)	Lead			Verify, Support AA/SMA Implementation			Verify, Support AA/SMA Implementation
Establish and ensure compliance with SRM&QA strategies, policies, etc (NPD 8700.1, 5.b.3)	Lead	Coordinate with AA/SMA	Support, Provide Guidance	Support Compliance Oversight, Verify	Support	Support	Support Compliance Oversight, Verify
Terminate any operation that presents an immediate unacceptable risk (NPD 8700.1 5.b.4)	Lead	Implement	Implement	Implement	Implement	Implement	Implement
Ensure that effective and efficient SMA functional Management is in place (NPD 8700.1, 5.b.5	Lead	Participate	Support Verification	Support Verification	Participate	Participate	Verify
Provide oversight to ensure effective use of SRM&QA resources (NPD 8700.1 5.b.6)	Lead		Support Verification	Support Verification			Verify
Ensure an alternative, independent line of communication to appropriate levels of management (NPD 8700.1, 5.b.7)	Lead	Support	Support	Verify	Support	Support	Verify

Function	Associate Administrator for Safety and Mission Assurance	Associate Administrator for Space Flight	HSF Center Director and Center SMA/SH&IA Director	HEDS SMA Independent Assurance Director	HSF Program/ Project Manager	HSF Program/ Project SMA Functional Manager	OSMA HSF Program Manager
Ensure oversight and independent assessments to ascertain that appropriate risk management practices are used. (NPD 8700.1, 5.b.9)	Lead		Support (SH&IA Implementation)	Implement			Implement
Direct and oversee prompt and accurate reporting, investigating, and analysis of all mishaps (NPD 8700.1 5.b.10)	Lead	Implement	Support Implementation	Verify	Implement	Implement	Verify
Develop SMA Program/project Plan (NPG 7120.5)		Implement	Support	Verify	Lead	Support Lead	Verify

CHAPTER 2: Safety and Mission Assurance Requirements for Human Space Flight (HSF)

2.1 HSF Programmatic SMA Requirements

The HSF Program/Projects are responsible for defining and documenting, mission success criteria, and safety and mission assurance and risk management programmatic requirements over the entire life cycle in all NASA solicitations, acquisitions, cooperative agreements, program plans and project plans. Agency level definition of mission assurance processes are defined in NPD 8700.1, "NASA Policy for Safety and Mission Success and in both NPD 7120.4, "Program/Project Management", and NPG 7120.5, "Program and Project Management Processes and Requirements" and should be incorporated into program/project documents as applicable. These processes shall address management, as well as design and development, integration, test and operation phases.

2.2 HSF Technical SMA Requirements

NPG 8705.xx,"Human Rating Procedures and Guidelines," implements agency safety policy by establishing human rating procedures and guidelines for Agency space systems that carry humans or whose function or malfunction may pose a hazard to NASA space systems that carry humans. Detailed instructions for human rating requirements are established in JSC 28354,"Human Rating Requirements, and as such, will be followed in order to comply with the requirements established in the NPG.

2.3 Basic Set of HSF SMA Flight Certification Elements

NPD 8700.1, "NASA Policy for Safety and Mission Success" requires the certification of safety and operational readiness of flight hardware/software, mission critical support equipment, hazardous facilities/operations through a formal review processes. Through ongoing surveillance of program, project and contractor processes, the PAR and CoFR process, the Associate Administrator is able to gain the knowledge and understanding needed to concur an HSF mission is ready for flight. Table 2 provides a decomposition of key agency SMA policy requirements to guide the program/project on the minimum set of "SMA Flight Certification Elements" that must be implemented and completed in order to be ready for flight. Table 2 elements should flow into the respective program/project SMA certification plans. Table 2 is not meant to be all-inclusive but representative of the key element areas involved in SMA certification. It is intended that OSMA representatives shall spot check requirement implementation while the HSF Program SMA Functional Manager shall be responsible for evaluating the quality and thoroughness of the implementation products. The elements listed in the Reference Documentation column provide the reference to the base Agency requirements. The Notes column on the table provide reference documentation employed by the Space Shuttle and International Space Station Programs to meet these requirements.

Table 2: SMA Flight Certification Elements Defined in Requirements Documents

Endorsement	Element	Reference Documentation	Notes
1	Program management documentation required per NPG 7120.5 has been completed and the SMA paragraphs are current. NPG 7120.5 SMA-related documentation includes: Program Control Agreement (PCA), Program Plan, Project Plan, Configuration Management Plan, Risk Management Plan, System Safety Plan, NASA SMA Plan, Prime Contractor SMA Plan, and Systems Engineering Master Plan.	NPG 7120.5: Paragraphs 4.3, 4.6, and Appendix E	
2	Program management documentation required per Risk-Based Acquisition Management (R-BAM) in the NASA FAR Supplement has been completed and the SMA Paragraphs are current. R-BAM SMA related documentation includes: Source Evaluation Board Membership, Acquisition Planning (SMA and risk management participation), Risk-based Contractor Surveillance Plan, Instructions to Offerors, and Evaluation Criteria, Quality Assurance Surveillance Plan developed for the statement of work, and Pre-award Audit Planning	NASA FAR Supplement NPG 7120.5: Paragraph 4.5.5	
3	Mission Assurance Surveillance Record has been developed and maintained.	NPG 8705.xx: Chapter 3 NPG 8735.2 NPG 1441.1 NPG 8715.3: Paragraph3.10	
4	The flight articles (both hardware and software) have been built to the applicable specifications and drawings. Any exceptions to the design requirements have been approved and documented.	NPG 8715.3 1.3.4, 3.11	See SSP 30695
5	Program/project design and operations requirements are managed in a controlled and maintained manner.	NPG 8715.3 1.3.4, 3.11	
6	A list of limited life hardware (time, cycle) has been identified and the logistics and maintenance planning have been addressed.	NPD 8720.1	See SSP 50231

Endorsement	Element	Reference Documentation	Notes
7	Hardware design for risk management (e.g., failure modes and effects analysis, hazard analysis) is planned and implemented. A list of safety and mission critical hardware and software items (i.e.; critical items, mission hazards) has been identified and addressed. Mission risks are within designed factors of safety.	NPD 8720.1	See SSP 30234 See SSP 50231
8	All reported hardware/software problems and non-conformances have been resolved or accepted.	NPD 8720.1: 1.c & 5.c	See SSP 30223
9	Hardware test, verification, validation, verification, quality assurance, quality control are planned, implemented, and documented.	NPG 7120.5	
10	For operations outside of the control of NASA, consultations have been conducted with the NASA General Counsel, the Associate Administrator for External Relations, and the Associate Administrator for Safety and Mission Assurance regarding whether the outside entity has adequately addressed safety provisions.	NPG 1000.3 NPG 8715.3: 1.12	See NPD 8700.2: 5.f.4
11	Compliance with host range requirements for public and worker safety for operations and agreed to by range to include FTS security has been demonstrated.	NSTISS Policy Number 12	See NPG 8705.xx: Appendix B See KSC HB 1700.7 If U.S. DoD Range: EWR 127-1: 1.4
12	Risks associated with any hardware, software, and services (e.g.; launch services) provided to the program/project have been reviewed and mitigated or accepted by NASA. All risk management activities have been completed and documented as acceptable.	NPD 7120.4 NPG 7120.5 NPG 8705.xx: 4.4 NPG 8715.3: 1.3.7	See NPD 8700.xx 5.f.1 See SSP 50134

Endorsement	Element	Reference Documentation	Notes
13	Mission assurance analysis and assessments have been completed and identified risks have been accepted.	NPD 8710.2: 1.b NPD 8720.1: 5.c NPG 8715.3: 1.3, 1.11, 3.2.5, 3.3, 3.5, Chapter 6 EWR 127-1: 1.4	See NPG 8705.xx: 4.4.h-n, Appendix B
14	Program/Project has notified the appropriate agencies for issuance of public safety notices (i.e., FAA for Notice to Airmen, USCG for Notice to Mariners)	NPD 1000.3 (NASA Values)	See NPD 8700.2: 5.d
15	Risks associated with any hardware, software, and services (e.g.; launch services) provided to the program/project has been reviewed and mitigated or accepted by NASA.	NPD 7120.5	See SSP 50134
16	Program/Project has defined a safety process and identified risks have been mitigated and/or accepted.	NPD 8710.2: 1.h NPG 8715.3: 1.3, 1.11, 3.2.5, 3.3, 3.5-3.8, chapter 6	See NPG 8705.xx: 4.4.h-n, Appendix B See SSP 30599 See NSTS 13830
17	Program/project has defined reliability and maintainability planning and provided for its implementation	NPD 8720.1	
18	Aviation safety program requirements have been met.	NPG 8715.3: Chapter 7	Applicable to all airplane-like EAV's
19	A formal orbital debris assessment has been performed.	NPD 8710.3	Applicable to all programs and projects that may generate orbital debris See NPG 8705.xx: Paragraph 4.4.f, and Appendix B

Endorsement	Element	Reference Documentation	Notes
20	All sites, facilities, personnel, and procedures are ready to safely support atmospheric and/or on-orbit operations. Flight rules and the flight test plan have been reviewed for SMA impacts and approved.	NPG 8715.3: 6	
21	The mission support team and crew have been identified, training/certification is completed, and personnel are ready to support the atmospheric and/or on-orbit operations. Mission support team and crew procedures have been defined and adopted.	NPG 8715.3: Chapter 6	
22	All personnel, facilities, Ground Support Equipment (GSE), and procedures are ready to support integration activities into the launch vehicle.		
23	Required software IV&V has been identified, planned, conducted, and documented.	NPD 8730.4 NPG 8730.xx	
24	Final ground and flight software loads have been validated and verified and are acceptable.		
25	All critical data and critical communications are secure.	NPG 2810.1 NPG 8705.xx: App B.6	For FTS and other safety critical functions
26	Program Flight Certification process(es) have been followed and SMA findings have been addressed.	NSTISS Policy #12 NPD 8700.1 (Pending Revision)	See NPD 8700.xx: 5.b.2 See SSP 50106 See SSP 50231
27	An emergency preparedness and contingency plan has been developed and covers recovery from all flight test operation anomalies.	NPD 8710.2: 5.g. & 7 NPG 8621.1 NPG 8715.3: 1.6.1	See NPG 8705.xx: 4.4.e

Endorsement	Element	Reference Documentation	Notes
28	All pressure vessels being used are certified safe.	NPD 8710.5: 1.a, g, h NSS/HP-1740.1	See NPG 8705.xx: 4.4.e See SSP 50021 See NSTS 1700.7 See KHB 1700.7 See SSP 50004
29	Program/Project has been reviewed for radioactive materials and, if present, nuclear launch safety approval obtained.	NPG 8715.3: Chapter 5	See SSP 50021 See NSTS 1700.7 See KHB 1700.7 See SSP 50004
30	The Program/Project has included Alerts, Government-Industry Data Exchange Program Alerts, and NASA Alerts in the risk management program and they have been closed/accepted.	NPD 8720.1: 5.c.5	
31	The NASA Limited Life Item System and Preferred Practices System have been used to document, and investigate Safety, Reliability, Maintainability, and Quality Assurance techniques.	NPD 8720.1: 5.a.4 & 5.c.6	
32	All relevant NASA Safety Reporting System reports have been assessed.	NPD 8700.1	
33	All open work items applicable to flight, from operations and SMA reviews, have either been closed or are planned for closure before flight.	--	
34	Compliance with NPG 8700.xx, “Human Rating Procedures and Guidelines.”	NPG 8705.xx	

CHAPTER 3: Safety and Mission Assurance Processes for Human Space Flight

3.1 SMA Processes for Human Space Flight

The SMA management processes are designed to identify and mitigate HSF program/project risk to acceptable levels. Section 3.2 describes the general commit-to-flight review process for HSF programs/projects. SMA's involvement specific to the ISS and Space Shuttle Certification of Flight Readiness (CoFR) process are also defined. The role of the ISS Mission Management Team is described in section 3.3 with specifics for the ISS and Space Shuttle. Processes used by OSMA to gain insight and facilitate SMA are described in Section 3.4.

The objectives of the OSMA management processes are to accomplish the following:

a. Implement NPD 8700.1, "NASA Policy for Safety and Mission Success," in the conduct of HSF programs through independent SMA analysis, evaluation efforts, and critical in-line SMA surveillance activities.

b. Ascertain the collective position on flight readiness of the entire HSF SMA community in an independent manner, including civil service and contractor staff, as the foundation for the SMA decision to proceed to launch, execute the mission, sustain on-orbit operations, and return the crew safely to Earth.

c. Provide an alternative independent communications path to senior NASA management for issues and concerns that potentially adversely affect flight and ground safety and the ability to meet minimum mission success criteria.

d. Evaluate the effectiveness of HSF SMA community activities, specifically in preparation for the launch or the next mission phase.

e. Assess, as needed in near-real time, unplanned or potential contingency events that occur during human space flight missions or during preflight processing.

f. Define and establish specific NASA surveillance (i.e., oversight, insight) processes to assure compliance with NASA SMA program policy, requirements, and guidelines.

g. Verify ongoing implementation of SMA process requirements throughout the design, development, manufacturing, acceptance, assembly and checkout, and operation of HSF vehicles. The HSF Program SMA Functional Manager has primary responsibility for verification of SMA process implementation, with support from NASA Headquarters, Center functional organizations, and program/project personnel.

h. Certify that all the necessary and appropriate SMA activities have been successfully completed and all the identified SMA risks have been controlled to an acceptable level as a part of the flight certification process in the SMA Prelaunch Assessment Review (PAR) (see Appendix B).

3.2 Commit-to-Flight Review Process

The commit-to-flight review process comprises a series of program reviews and readiness polls structured to allow NASA senior management to incrementally assess progress toward readiness for flight and mission execution. Each incremental review provides additional certification and verification of flight readiness. The final Flight Readiness Review (FRR) provides senior NASA management a summary of the certification and verification activities completed and rationale for acceptance of residual risk. The FRR process provides the mechanism for all NASA and contractor organizations contributing to the program(s) to certify/verify that the necessary tasks, activities, analyses, and data products associated with the endorsement statements have been accomplished and indicate a high probability of mission success. By signing the Certificate of Flight Readiness (CoFR), NASA senior managers in attendance agree to accept the residual risks associated with mission execution.

Like other programmatic organizations at the FRR, the SMA community is required to attest to the successful completion of its activities and responsibilities. HSF SMA organizations are responsible for the certification and verification of all SRM&QA tasks and products associated with a mission. In support of program requirements, the SMA organizations provide direct support to the program/project SMA managers and must certify their products at each incremental review. Program/project SMA manager certification shall be documented through project CoFR endorsements. Presentations at the Program Flight Readiness Review shall include sufficient information and supporting evidence to verify SRM&QA task completion. Upon satisfactorily verifying project-level SRM&QA task accomplishment, the program SMA manager certifies acceptance by signing the program Certificate of Flight Readiness. Program/project presentations at the program Flight Readiness Review shall include sufficient information and supporting evidence to verify SRM&QA task completion.

The FRR agenda includes a specific "Safety and Mission Assurance" agenda item during which an OSMA representative presents the SMA position. This presentation reflects the program/project(s), HEDS Independent Assurance function, and oversight efforts used by OSMA to arrive at the CoFR position. The presentation summarizes all SMA activities conducted in support of the mission and serves as evidence of compliance with NPD 8700.1, "NASA Policy for Safety and Mission Success," by the OSMA, programs, and HSF Center SMA organizations. The Associate Administrator for Safety and Mission Assurance utilizes information from the program, HEDS SMA Independent Assurance function, oversight activities, and other sources to formulate a CoFR decision.

3.2.1 Participating Organizations

NASA organizations specifically assigned to the various SMA tasks are expected to encourage open communications, accomplish and verify performance in their area of responsibility, and involve senior SMA management in SMA processes. Specifically, each review forum conducted by the OSMA to evaluate flight readiness will meet the following expectations:

3.2.1.1 The senior SMA representative of the following organizations will be in attendance at each meeting:

a. NASA HEDS Enterprise Centers and HSF program SMA organizations

b. Prime contractor(s) SMA organizations for HSF.

c. Independent Assurance: HEDS SMA Independent Assurance, MSFC Independent Assurance & Integration Department, and KSC Safety, Health and Independent Assessment.

d. Headquarters: Office of Safety and Mission Assurance (OSMA).

e. Astronaut Office: Safety Branch Chief.

3.2.1.2 In all SMA reviews, everyone in attendance is obligated to apply individual experience, knowledge, and wisdom in assessing the adequacy of problem/risk closure and rationale to proceed.

3.2.1.3 At the discretion of senior SMA managers, the most knowledgeable individual(s) will be present to discuss key areas of emphasis. Non-SMA organizations/individuals may be invited to present information for consideration.

3.2.1.4 To make this process effective, communications must be professional in nature, open, and honest; with no fear of retribution or condemnation.

3.2.1.5 In all SMA reviews, each organizational entity shall be provided the time needed to express facts, opinions, issues, and concerns. At the conclusion of the HSF SMA flight readiness process, the Associate Administrator for Safety and Mission Assurance and other Certificate of Flight Readiness signatories will consider all input provided and use that data and information in the formal CoFR decision making process. Participation in this process does not relieve any organizational entity from accountability in performing their assigned program/project responsibilities. In addition, the HSF SMA flight readiness process is not a consensus-building process. Participants may arrive at different readiness positions and pursue alternate paths for resolution.

3.2.2 Formal Space Shuttle and ISS CoFR Process Overview

The formal CoFR process culminates at the FRR. The FRR is an integrated senior management review chaired by the Associate Administrator for Space Flight and supported by a review board. It is a program requirement that the Associate Administrator for Space Flight make an assessment of mission readiness prior to each flight. This is accomplished by a comprehensive review of all activities/elements necessary for the safe and successful conduct of all operations from prelaunch through post-landing and recovery operations. Each program element certifies, through signature by the cognizant NASA and contractor senior management, that all required processes, products, and responsibilities are complete or will be completed prior to launch. The formal FRR Board is comprised of the Associate Administrator for Safety and Mission Assurance, the Associate Administrator for the prime mission (non-ISS missions), the Deputy Associate Administrator for Space Operations (Shuttle), HEDS Enterprise Center Directors, Space Shuttle Program Manager, and the program manager for the Space Flight Operations Contract. For ISS missions, the Deputy Associate Administrator for HSF Development (Space Station) replaces the Associate Administrator

for the prime mission, and the NASA ISS Program Manager and ISS prime contractor (Boeing) program manager are added to the board.

In preparation for the formal FRR and Certificate of Flight Readiness signature, each organization supporting the Space Shuttle launch, mission execution, and recovery conducts a flight preparation readiness process. Plans for the Space Shuttle program flight readiness process are contained in NSTS 08117, "Requirements and Procedures for Certification of Flight Readiness." Plans for the ISS program flight readiness process are contained in SSP 50108, "Certification of Flight Readiness Process Document." As applicable for each organization, the process plans document all major and critical operations (design, certification, analyses, tests, documentation, and requirement definition) for each mission. SMA organizations at each HSF Center perform in-line responsibilities that directly support each Space Shuttle element and the ISS. In-line SMA process completion and products required to support each project/element are documented in the flight preparation plans found in NSTS 08117 (for Space Shuttle) and SSP 50108 (for ISS).

There are two additional flight preparation plans that specifically address SMA activities. NSTS 08117, Appendix Q, "Space Shuttle Safety, Reliability, and Quality Assurance Flight Preparation Plan," addresses the processes, activities, and products that each Center SMA organization provides to the Space Shuttle program and to the Associate Administrator for Safety and Mission Assurance through the existing PAR process. Independent Assurances performed by the HEDS Independent Safety and Mission Assurance Office and the KSC Safety, Health and Independent Assurance Directorate are also addressed. NSTS 08117, Appendix S, "The Safety and Mission Assurance Flight Preparation Plan," addresses the audit and surveillance activities of the Space Flight Operations Contract performed by the Manager, Space Shuttle Program Safety and Mission Assurance.

SSP 50231, "Safety and Mission Assurance Certification of Flight Readiness Implementation Plan," defines the ISS SMA activities to satisfy the CoFR requirements defined in SSP 50108. Included are endorsement requirements, organizational roles and responsibilities, tasks and products, processes, and reviews to support a particular flight and/or increment.

In addition to the in-line functions performed by the various NASA and contractor SMA organizations, a policy-mandated alternate independent communications path for discussion of flight and ground safety issues and concerns exists through the Associate Administrator for Safety and Mission Assurance. The policy to provide an alternative communications path is met in part through the SMA PAR process.

3.2.3 Prelaunch Assessment Review (PAR)

The SMA PAR (See Appendix C) is held to assess and confirm satisfactory completion of all of the SMA activities necessary to provide an acceptable level of confidence in safety and mission success for an HSF mission. The PAR provides the mechanism for all of the responsible SMA elements (NASA Center, contractor, in-line, Independent Assurance, Headquarters) to thoughtfully assess launch readiness status, open work, issues, and concerns, and then provide a consolidated HEDS SMA assessment of system readiness.

The PAR results in the participants demonstrating a complete understanding and acceptance of the integrated mission risks and provides the basis for the Associate Administrator for Safety and Mission Assurance and other SMA signatories to knowledgeably sign the Certificate of Flight Readiness. The PAR also results in the definition of topics to be addressed by the SMA representative in the FRR presentation.

To ascertain the integrated readiness of the entire SMA community, each active stakeholder must participate. International Partners may participate if they desire.

During the PAR, each SMA stakeholder; i.e., contractor, NASA Center, in-line SMA function, and Independent Assurance function, is responsible for reporting on their performance of assigned responsibilities such as study and analysis results, independent technical assessments, validation efforts, audits, completion of required work, and surveillance of contractor efforts. As a result of their efforts, each organization shall submit significant evaluation activity listings, discussion items, and issues/concerns for the PAR. Each organization must demonstrate they have fulfilled program, Center, and Agency requirements and directives and identify shortfalls as exceptions.

The Associate Administrator for Safety and Mission Assurance chairs the PAR meeting. As a result of the PAR, the SMA representative designated by the Associate Administrator for Safety and Mission Assurance will prepare an integrated SMA presentation using data reported by the projects at PAR's. The SMA representative will present the SMA findings to the formal FRR board. The presentation will contain any CoFR exceptions and a readiness statement.

Payloads will be assessed in the same manner as other flight hardware and will be reported on during the PAR process. The applicable NASA Center SMA organization will update the status of compliance with SMA requirements and, together with JSC/KSC Payload Safety Review Panels, provide updates or status of any unresolved issues/concerns and completion of the safety review process.

The applicable NASA Center SMA organization will provide a brief description of each NASA-developed payload and provide status of compliance to SMA requirements added beyond those of NSTS 1700.7B at the PAR meeting. In addition, KSC and JSC Payload Safety Review Panels will provide status of the safety review process, as defined in NSTS/ISS 13830, for non-NASA developed payloads (including private sector, foreign government, and non-classified DOD).

KSC provides status of payload processing through the KSC Payload Safety Review Panel review process. JSC and KSC Payload Safety Review Panels will identify any known payload issues related to the safety of the flight.

The JSC Payload Safety Review Panel provides generic statements related to the completion of the safety review process of DOD classified payloads.

3.2.4 Mission Management

Following the formal FRR, the SMA community focuses its attention to the completion of the planned open work, proper closeout of any CoFR exceptions identified at the FRR, and any non-standard

activities within their assigned area of responsibility. In preparation for launch, mission execution, and recovery, the Mission Management Team (MMT) is activated at the Prelaunch Mission Management Team (PMMT) Review to initially assess deltas to flight readiness since the FRR and to provide a go/no-go determination to continue the countdown. The Associate Administrator for Safety and Mission Assurance designates or approves the SMA MMT member for both the Space Shuttle launch countdown and for HSF activities. MMT, mishap reporting, and contingency activities are defined in Appendix D.

3.3 SMA Boards, Panels, and Other Processes

The OSMA utilizes other SMA activities to gain insight into and assess the total safety and potential success of human space flight programs/projects. The following activities describe the major mechanisms by which the OSMA gains insight.

3.3.1 Space Flight Safety Panel (SFSP)

The SFSP reports to the Associate Administrator for Safety and Mission Assurance. The SFSP provides for representation of flight crew personnel in the assessment of space flight safety. The panel ensures that safety issues and recommendations are identified and assessed during the development and implementation of NASA space flight programs and addressed in subsequent technical and management decisions

The SFSP promotes NASA space flight safety for HSF programs in accordance with the SFSP Charter in NPG 1000.3, "The NASA Organization."

3.3.2 HEDS Assurance Board (HAB)

The HEDS Assurance Board (HAB), chaired by the Associate Administrator for Safety and Mission Assurance, provides the forum necessary to proactively assess the SMA processes internal to the HEDS Enterprise, identify deficiencies, and make recommendations for correction. The HAB provides senior NASA management with timely, objective, nonadvocacy assessments of program risk, status, and relative safety posture of the HEDS Enterprise. Figure 3.4-1 depicts the membership of the HAB and Appendix B provides further details.

The HAB responsibilities include:

a. Assessing the work processes and overall effectiveness of the entire HSF SMA community.

b. Reviewing HSF programs to ensure that proper attention is being paid to risk.

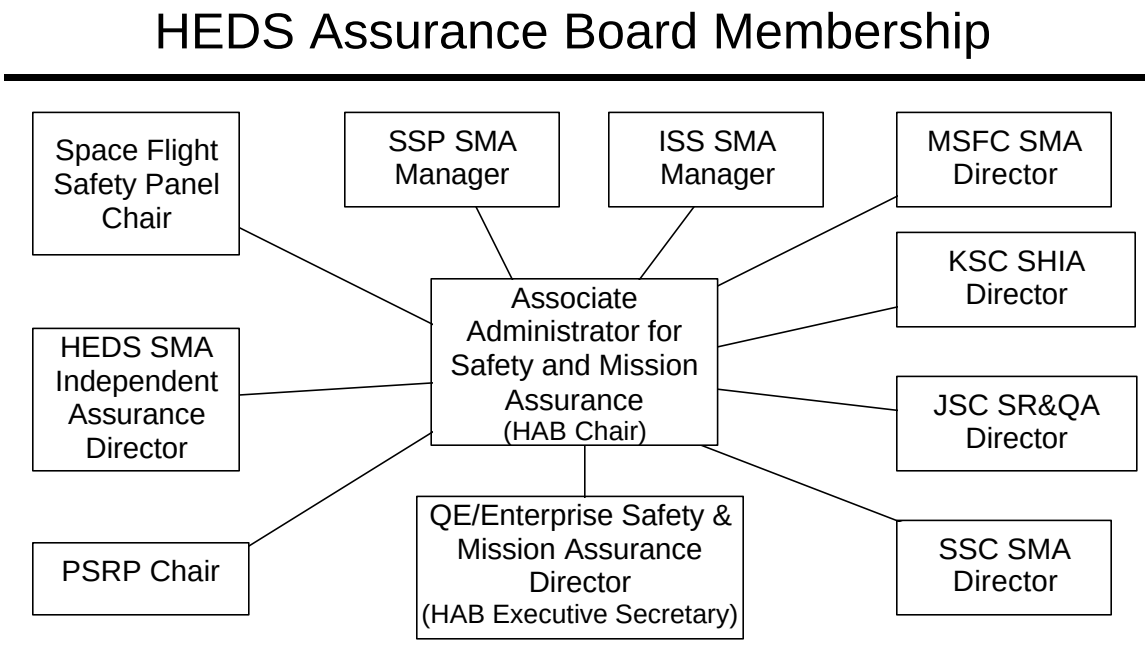

Figure 3.3-1: HEDS Assurance Board Membership

c. Reviewing the overall effectiveness of the hardware, software, and operational aspects of the program to assure proper emphasis is being place on public safety, astronauts, NASA workforce, high-valued equipment and property to assure safety and mission success.

The Independent Assurance function is responsible for looking over the near-term horizon of human space flight programs to assure that proper attention is being paid to items that may turn into concerns. Assessments being performed are not mission specific and address a broader scope of a human space flight program. The HAB investigates all avenues that could propagate into failure, e.g., communication, organization, etc. The HAB identifies and assesses these areas and reports the results to the program and independently to the Associate Administrator for Safety and Mission Assurance through both mission specific and non-mission specific SMA forums.

3.3.3 Process Verification (PV)

Much of the confidence in the overall safety and mission integrity of the HEDS Enterprise is found in the robustness of the day-to-day operations of the Program/Project Center SMA processes. Accordingly, the Associate Administrator for Safety and Mission Assurance has established a process verification methodology to independently assess the compliance to OSMA policies, effectiveness of ongoing SMA activities, availability and quality of resources, and the robustness of the risk screening process.

To implement PV methodology, OSMA conducts reviews to uncover areas and causal factors where SMA processes at a given Center or across Centers are not sufficiently effective or could be improved. (See HOWI 8700-Q006, "Manage SMA Process Verification")

3.3.4 HEDS SMA Independent Assurance (IA)

Independent Assurance (IA) is one of the techniques used by the OSMA to fulfill its assigned responsibilities. The OSMA has authorized the HEDS SMA IA Office for the Space Shuttle, ISS and advanced projects to assess the safety and potential success of HSF programs/projects. The HEDS SMA IA Office advises the program/project managers, the Associate Administrator for Safety and Mission Assurance, and through the Associate Administrator for Safety and Mission Assurance, the NASA Administrator and other appropriate senior NASA managers of significant safety, assurance, and mission success issues.

The HEDS IA Director provides advice based on timely, objective, non-advocacy assessments of HSF program/project risk management activities and processes, on the inherent technical, SRM&QA, and risk management expertise applied by the HEDS SMA IA Office staff. IA results provide a systems integration view of the overall health and status in key areas of Space Shuttle and ISS design, engineering processes, manufacturing, assembly, and operational mission capabilities. These assessments focus on providing inputs to the HEDS SMA IA Office customers, the SMA Prelaunch Assessment Review, and the HEDS Assurance Board decision making processes and identifying key programmatic risks in a timely fashion. As a result of the assessments performed, the HEDS SMA IA Office provides an input to the go/no-go for launch and provides concurrence on the SMA Certificate of Flight Readiness for HSF missions. Special design studies address unique program concerns to provide senior NASA management highly focused design assessments and operational impact studies without bias. In addition, the HEDS IA Office provides insight of the NASA IV&V activities provided to HEDS to assure they are providing a meaningful and independent view of HEDS software activities. Implementation of the HEDS SMA IA function is defined in the HEDS IA Plan for the HEDS Enterprise.

3.3.5 Annual Operating Agreement (AOA)

Annual Operating Agreements (AOA's) are Center SMA management plans, focused on customers of SMA products and services. AOA's establish the planning and execution processes to assure available SMA resources are allocated to optimize risk reduction.

AOA's help assure OSMA that sufficient Enterprise resources are allocated for the SMA functions and that the SMA processes are managed in a manner that meets Enterprise requirements.

The AOA process assures planning for SMA functions to meet the institutional, program, and project requirements; establishes a basis for negotiation at the HQ and Center level on resource allocations necessary to meet institutional, program, and project requirements; and uses metrics for management of the Center's SMA organization.

The AOA process encourages continuous improvement and closed-loop feedback of SMA process performance. NASA HQ HOWI 8700-Q005, "Development and Utilization of Annual Operating Agreements (AOA)" provide further detail of AOA development and implementation.

APPENDIX A. Acronyms

AA	Associate Administrator
AOA	Annual Operating Agreement
ASI	Agency Safety Initiative
BEO	Beyond Earth Orbit Vehicles
CIL	Critical Items List
CoFR	Certificate of Flight Readiness
CRV	Crew Return Vehicles
CTV	Crew Transfer Vehicles
DCMA	Defense Contract Management Agency
DTO	Design Test Objective
ETO	Earth to Orbit
EVA	Extra Vehicular Activity
FMEA	Failure Modes and Effects Analysis
FRR	Flight Readiness Review
GFE	Government Furnished Equipment
HAB	HEDS Assurance Board
HEDS	Human Exploration and Development of Space
HEDS IA	HEDS Independent Assurance
HSF	Human Space Flight
IFA	In-Flight Anomaly
ILC	Initial Launch Capability
IMMT	ISS MMT
IP	International Partner
ISO 9001	International Standards Organization Document 9001
ISS	International Space Station
ISS-PPD	ISS Program Policy Document
IV&V	Independent Verification and Validation
LCC	Launch Commit Criteria
MER	Mission Evaluation Room
MMT	Mission Management Team
MSFC	Marshall Space Flight Center
NCR	Non-Conformance Reports
NFSAM	Nuclear Flight Safety Assurance Manager
NLSA	Nuclear Launch Safety Analysis
NODIS	NASA On-line Directives Information System
NPD	NASA Policy Directive
NPG	NASA Procedures and Guidelines
NSRS	NASA Safety Reporting System
NSTS	National Space Transportation System
OSMA	Office of Safety and Mission Assurance
PAR	Prelaunch Assessment Review
PD/NSC	Presidential Directive / National Security Council Memorandum
PR	Problem Reports

PMMT	Prelaunch Mission Management Team
PSS	Planetary Surface Systems
PV	Process Verification
SFOC	Space Flight Operations Contract
SFSP	Space Flight Safety Panel
SHIA	Safety, Health and Independent Assessment
SMA	Safety and Mission Assurance
SoF	Safety of Flight
SORR	Stage Operation Readiness Review
SRM&QA	Safety, Reliability, Maintainability and Quality Assurance
SRP	Safety Review Panel (ISS)
SSRP	Space Flight Safety Review Panel (NSTS)
SSP	Space Station Program

APPENDIX B. HEDS Assurance Board

B.1 Overview

The HEDS Assurance Board (HAB) provides senior NASA management with timely, objective, non-advocacy assessments of program health, status, and relative safety posture of the HEDS Enterprise and HSF program/projects.

B.2 Approach

The HAB will identify deficiencies and make recommendations for correction. The HAB will assess the work processes and overall effectiveness of the entire SMA community, review HEDS programs to ensure that proper attention is being paid to risk, and review the overall effectiveness of the hardware, software, and operational aspects of the program to assure its safety and mission integrity. The board will place special emphasis on assessing the performance of program SMA, its ability to achieve "insight," its utilization of scarce resources (including Defense Contract Management Agency (DCMA)), its ability to certify contractor processes as stable and capable, and its ability to function effectively under the Administrator's management strategy and guidance.

B.3 Scope

B.3.1 The HAB assesses all aspects of the HEDS. It will provide an ongoing assessment of the safety and risk management for the HEDS Enterprise as a whole and each major human space flight program. This multi-disciplinary examination of the HEDS Enterprise recognizes the need to look at interrelationships between schedule, budget, technical complexity, human resource deployment and skill readiness, requirements definition, and design, manufacturing, operations issues, and successful space flight.

B.3.2 The HAB will provide a venue for consideration of specific programmatic risk issues that have not been satisfactorily resolved within the program

B.3.3 The HAB function will provide its customers with credible, objective, non-advocacy reports regarding the integrity of Enterprise and program processes at any specified time. The concept provides an added dimension to the role of Independent Assurance, insight rather than oversight, in the support of NASA Enterprises and programs. Each HAB member will provide an essential element for an accurate assessment of HEDS operations. Findings will be communicated to both the Associate Administrator for Space Flight and the NASA Administrator by the Associate Administrator for Safety and Mission Assurance.

APPENDIX C. Prelaunch Assessment Review

C.1 PAR Overview

This Appendix defines the assessment and data reporting requirements for the Safety and Mission Assurance (SMA) organizations that support the Prelaunch Assessment Review (PAR) process. The purpose of the PAR is to verify that all Safety, Reliability, Maintainability and Quality Assurance requirements (SRM&QA) have been completed, that the participants possess a complete understanding of the individual element and integrated mission risks, and that adequate justification exists for the Associate Administrator for Safety and Mission Assurance to sign the Certificate of Flight Readiness (CoFR).

C.1.1 Introduction

C.1.1.1 This Appendix provides an introduction to the overall PAR process, defines the scope of the process, describes the program's priorities, and describes the implementation of the PAR process.

C.1.1.2 The complete set of PAR data reporting elements covered by this document applies to joint Space Shuttle/ISS launches. Data reporting elements for individual Space Shuttle or ISS launches are subsets of the total set of data reporting elements. Application of specific data reporting elements to individual launches is shown in Chapter 3. PAR participants shall include, but are not limited to the officials listed in Table C-1.

Table C-1: PAR Process Members

Associate Administrator for Safety and Mission Assurance
Headquarters, Enterprise Safety and Mission Assurance Division Managers
HEDS SMA Independent Assurance (IA) Director
HEDS Center SMA Directors
KSC Safety, Health and Independent Assessment (SHIA) Director
KSC Space Shuttle SMA Division Manager
KSC ISS/Payloads SMA Division Manager
Astronaut Office Safety Branch Chief
ISS SMA Manager
SSP SMA Manager
SSP SR&QA Division Manager
Prime and Major Element Contractors – SMA Manager
Center SMA Organizations responsible for non-ISS Payloads involved with a Space Shuttle mission

C.1.1.3 The PAR process is designed to account for the different SMA priorities of the Space Shuttle and ISS programs. SMA priorities for the Space Shuttle program are concerned with launch, mission operation, and safe return to Earth of the vehicle and crew. SMA priorities for the ISS are concerned with long-term on-orbit ISS operation, crew safety, and the impact of launching payloads to existing ISS elements currently orbiting the Earth.

C.1.1.4 The significant evaluation activity identified should be limited to those items that have been worked for the flight being assessed. Consideration for submittal should be based on problem criticality, safety severity, problems that have generic implications, and problems that will be discussed by the projects. As applicable, SMA stakeholders will also provide written one-page summaries and/or results of independent SMA assessments that have been conducted. This supplemental information is not presented in detail at the PAR meetings.

The PAR process is a tool utilized by the SMA community to gain a complete understanding of the integrated risks of a specific mission.

C.1.2 Definition of the PAR Process

C.1.2.1 The PAR process consists of a series of teleconferences used to assess and confirm satisfactory completion of all of the SMA activities necessary to provide an acceptable level of confidence in success of the Space Shuttle mission and the ISS stage. This process and other key events leading to signing of the CoFR are shown in Figure D-1. The PAR process consists of the PAR, the Flight Readiness Review (FRR) PAR Tag-Up, and the Prelaunch Mission Management Team (PMMT) PAR Tag-Up. The PAR provides a mechanism for all responsible SMA elements to assess launch readiness status, on-orbit status, open work, issues and concerns, and provide a consolidated assessment of system readiness.

C.1.2.2 The PAR is held prior to the FRR and the PMMT Review. These reviews are defined in National Space Transportation System (NSTS) 07700, Volume VIII, "S[ace Shuttle Operations," NSTS 08117, "Space Shuttle Safety, Reliability, and Quality Assurance Flight Preparations, Appendix Q", and the Stage Operation Readiness Reviews (SORR) in Space Station Program as defined in SSP 50108, "Certificate of Flight Readiness Document".

C.1.2.3 The PAR also serves as an alternative, independent line of communication between in-line and independent SMA organizations and senior NASA management.

C.1.2.4 In support of the PAR a teleconference is conducted every Friday morning to discuss the PAR agenda, potential topics, issues, and concerns to be presented during upcoming PAR reviews and other factors related to the orderly conduct of the PAR. This telecom is referred to as the "PAR-5" meeting.

C.1.3 Goal

The PAR provides participants with a complete understanding of the individual element risks and integrated mission risks of a launch. The PAR also provides the basis for the Associate Administrator for Safety and Mission Assurance, and other SMA managers, to knowledgeably sign the CoFR. All participants are obligated to apply their individual experience, knowledge, and wisdom in assessing the adequacy of risk closure and rationale to proceed. Communications should be professional in nature, open and honest; with no fear of retribution or condemnation.

C.1.4 Scope

C.1.4.1 This Appendix applies to NASA HSF programs/projects, SMA organizations, and contractors (if cited in their contracts) who have responsibility in the design, development, processing, integration, and operation of HSF and significant Space Shuttle and ISS flight and ground hardware and software.

C.1.4.2 In order to meet the requirements contained in this document each PAR participant as defined in 2.2.1 is responsible for developing lower level policies, processes, procedures, and requirements to the extent necessary to support this process.

C.1.5 PAR Permutations

The PAR process may involve three different permutations of data reporting elements and responsibilities. The responsibilities for reporting for each of the permutations are shown in Table C-1. The three permutations are as follows:

C.1.6.1 Joint Space Shuttle and ISS missions.

C.1.6.2 Individual Space Shuttle missions.

C.1.6.3 Individual ISS missions. This permutation will be used primarily when a launch of ISS elements is performed by one of NASA's international partners.

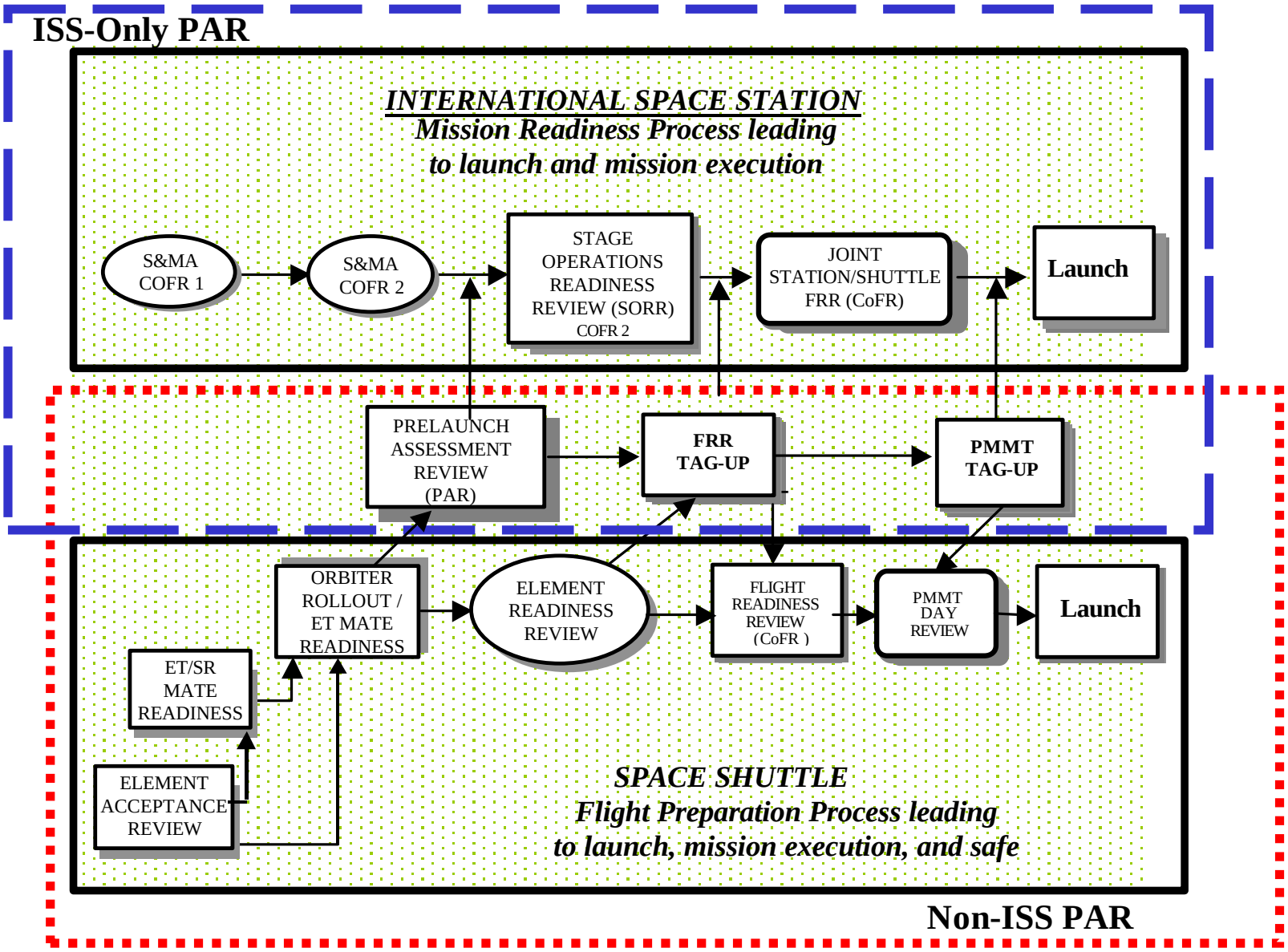

Figure C-1 Prelaunch Assessment Review Process Milestones

C.2 PAR Roles and Responsibilities

C.2.1 Overview

C.2.1.1 NPD 8700.1, "NASA Policy for Safety and Mission Success," requires the Associate Administrator for Safety and Mission Assurance to implement oversight and Independent Assurances to identify, document, evaluate, and disposition all SMA risks for programs, projects and operations. In addition, the Associate Administrator for Safety and Mission Assurance is required to ascertain the integrated readiness of the entire human space flight SMA community to proceed to launch, to execute the mission, and to return the crew safely to Earth

C.2.1.2 The Associate Administrator for Safety and Mission Assurance carries out this responsibility by utilizing both in-line and independent civil service and contractor organizations to evaluate and provide knowledge on the level of risk of each program.

C.2.1.3 Participation in this process does not relieve any organizational entity from accountability in performing their assigned program/project responsibilities.

C.2.1.4 Paragraph D.2.2 defines the roles and responsibilities of the participants in the PAR process. Tables D.2, D.3, D.4, and D.5 show specific responsibilities for data reporting.

C.2.1.5 In addition to the responsibilities specified in paragraph D.2.2, each participant in the PAR process (with the exception of the Associate Administrator for Safety and Mission Assurance) shall perform the following:

a. Prepare and present the results of readiness assessment(s) in accordance with the data element reporting responsibilities in Tables D-2, D-3, D-4, and D-5. Note: Data reporting elements in common areas of responsibility may be combined and presented in one presentation.

b. Provide electronic copies of PAR presentation materials to the PAR Administration at least 48 hours prior to the review. As a minimum the presentation material shall include one-page summaries of the readiness assessments, presentation charts, and a list of all assessments performed.

c. Respond to assigned action items by the due date.

C.2.2 PAR Participants and Responsibilities

This section defines the roles and duties of each PAR participant listed below:

C.2.2.1 Associate Administrator for Safety and Mission Assurance

With respect to the PAR, the Associate Administrator for Safety and Mission Assurance will perform the following:

a. Chair the PAR Teleconference.

b. Concur on proposed action items for subsequent PAR meetings.

c. Concur on closure of all formal action items.

C.2.2.2 NASA Headquarters Enterprise Safety and Mission Assurance Division

For the PAR, designated representatives from the NASA Headquarters Enterprise Safety and Mission Assurance Division will perform the following:

a. Participate in Program CoFR activities.

b. Attend the PAR meeting teleconference and subsequent tag-ups.

c. Assure all NASA Safety Reporting System (NSRS) reports affecting the mission are satisfactorily dispositioned.

d. Assure issues relevant to SMA are presented at the PAR.

e. Participate in the PAR-5.

C.2.2.3 NASA SMA Organizations

C.2.2.3.1 NASA Center Offices

a. NASA Center SMA Offices include Johnson Space Center (JSC), Kennedy Space Center (KSC), Marshall Space Flight Center (MSFC), and Stennis Space Center (SSC).

b. To support the PAR, NASA Center SMA Offices shall perform the following:

(1) Provide necessary resources and support to the Space Shuttle and ISS programs to ensure that responsibilities of their Center in the HSF programs, or payloads that have a potential impact on other programs, are fully compatible with the intent of the PAR process. Each NASA Center SMA Office shall conduct overall SMA readiness assessments to assure the effectiveness of their Center's SMA processes on the Space Shuttle and ISS programs.

(2) Assure that the contractor and Government Furnished Equipment (GFE) suppliers perform the necessary SMA analysis and activities to demonstrate compliance with technical and programmatic requirements.

(3) Assess payloads in the same manner as other flight hardware and report on the status of compliance to the SMA requirements during the PAR. This responsibility rests with the NASA Center SMA Office that has been assigned SMA responsibility for the payload. For non-NASA developed Space Shuttle or Joint Space Shuttle/ISS payloads, the JSC Payload Safety Review Panel representative will provide a description of each payload and status of its progress through the review process defined in NSTS 1700.7B. "Safety and Requirements for Payloads using the Space

Transportation System." The KSC Ground Safety Review Panel representative will provide status of each payload's progress through the ground safety review process defined in KHB 1700.7B, "Space Shuttle Payload Ground Safety Handbook" and the results of the ground portion. For non-NASA developed payloads for ISS launches that do not involve the Space Shuttle, either the procuring NASA Center SMA Office or ISS SMA will provide a brief description of each payload, the SMA requirements that were used in the payload, and the status of compliance to those requirements.

C.2.2.3.2 International Space Station Program SMA Office

To support the PAR the ISS SMA will perform the following:

a. Report on the overall SMA assessment relating to ISS flight hardware, software, and support equipment for NASA and non-NASA developed components and mission operation planning.

b. Verify completeness of SMA technical and programmatic tasks defined in the Bilateral Data Exchange Agreements with each International Partner.

C.2.2.3.3 Space Shuttle Program SMA Office

To support the PAR, Space Shuttle SMA shall report on the overall SMA assessment relating to Space Shuttle flight hardware, software, and support equipment for NASA and non-NASA developed components and mission operation planning.

C.2.2.4 Non-HEDS SMA Offices responsible for Major Payloads

To support the PAR, non-HEDS SMA Offices responsible for major payloads will report on the status of their assigned activities.

C.2.2.5 KSC Safety, Health and Independent Assessment (SHIA)

To support the PAR, the KSC SHIA shall validate the KSC ISS/Payloads SMA Division and KSC Space Shuttle SMA Division CoFR endorsement statements.

C.2.2.6 HEDS/Space Shuttle/ISS Integrator

To support the PAR, the HEDS/Space Shuttle/ISS Integrator shall perform the following:

a. Facilitate the PAR and PAR-5 teleconference meeting.

b. Integrate activities across all participants involved in the PAR process.

c. Act as the spokesperson for the SMA community at FRR and PMMT reviews. The report at the FRR comments on the following as a minimum: significant assessments, NASA Safety Reporting System status, new accepted risk Space Shuttle hazard reports and new Critical Item List (CIL), significant Independent Assurances, significant open work, CoFR exceptions, open action items, and SMA readiness statements.

d. Maintain action items and coordinate closure with the Associate Administrator for Safety and Mission Assurance.

C.2.2.7 HEDS SMA Independent Assurance

In support of the PAR the HEDS SMA IA shall present a summary of the assessment work done relative to the Space Shuttle mission and the ISS stage.

C.2.2.8 Astronaut Office Safety Branch

In support of the PAR the Astronaut Office Safety Branch shall validate the readiness of the Space Shuttle Crew and the ISS crew(s) to proceed with the mission.

C.2.2.9 ISS Prime Contractors

To support the PAR, ISS Prime Contractors will report on the status of their assigned activities.

C.2.2.10 ISS International Partners

ISS International Partners are not required to support the PAR, but may attend if they desire. Bilateral Data Exchange Agreements exist for each International Partner to define the SMA technical and programmatic requirements that must be met by the International Partner. If the International Partner chooses to participate in the PAR process then they will report on the overall SMA readiness assessments for the applicable flight hardware, software, and support equipment.

C.2.2.11 PAR Administrator

The PAR Administrator is responsible for administrative functions in support of the PAR. Duties include the following:

a. Coordinating PAR meetings with the participants.

b. Scheduling and providing notification of all meetings.

c. Transmitting meeting agenda to each participating organization.

d. Providing for voice recording the discussion of the PAR.

e. Maintaining all presentation materials for historical records.

f. Administrating the PAR website.

g. Maintaining PAR-5 minutes

h. Documenting and distributing action items.

C.3 PAR Data Reporting

C.3.1 Data Reporting Elements

Table C.-2 provides a complete listing and description of data reporting elements for the PAR. These elements comprise the minimum set of items to be presented at the PAR. This listing of data reporting elements applies to joint Space Shuttle and ISS launches. Data reporting elements for individual Space Shuttle and ISS launches are sub sets of this complete set of data reporting elements.

C.3.2 Data Reporting Responsibilities

The office or individual responsible for reporting the data elements shown in Table C-2 is displayed in Tables C-3, C-4 and C-5. The representative(s) reporting the data can be either the civil servant or contractor representative for the area of responsibility. Data reporting elements in common areas of responsibility may be combined and presented in one presentation.

C.3.3 Data Element Definitions

The information required to fulfill expectations in each data reporting element is shown in Table -2.

C.4 SMA PAR Activities and Milestones

PAR meetings are scheduled to precede key program CoFR milestones. The HEDS SMA CoFR milestone reviews include the FRR and the Prelaunch Mission Management Team (PMMT) Review. NSTS 08117, "Procedure for Certification of Flight Readiness," contains detailed definitions of the Space Shuttle milestone reviews. SSP 50108, "Certificate of Flight Readiness Process Document," outlines ISS program reviews. Figure D.1, "Prelaunch Assessment Review Milestones," defines the PAR activities relative to the ISS and Space Shuttle program CoFR milestones. The PAR is normally held less than one week prior to the Stage Operations Readiness Review (SORR) if it is a dedicated ISS flight or one week prior to FRR for a Space Shuttle mission. PAR tag-up meetings are held prior to the formal FRR and PMMT review meeting.

Table C-2: Data Reporting Elements

Data Reporting Element	Reporting Element Definition
Certification	• Summary of uncertified hardware with expected completion date. · Any area considered a potential constraint together with background and actions being taken.
Extra Vehicular Activity (EVA) Readiness	· Summary of the EVA activities including those to be performed by the Expedition crew. A description of any issues or concerns associated with performance of the EVA's.
Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL)	• Status of any open ISS FMEA's and the estimated date of closure. • A table that describes the background and acceptance rationale on any ISS CIL's. · Discussion of FMEA/CIL changes that represent any new Space Shuttle Criticality Category 1 failure modes or increased risk.
Government Surveillance	• A summary of work completed specific to the flight or mission under review that provides evidence of contractor compliance to program requirements.
Hardware Problem Reports (PR's) (Including In Flight Anomaly (IFA) PR's)	• Any open hardware issues or unexplained anomalies, including background and description of actions being taken. • Any significant failures that may have occurred associated with the flight hardware that, if it would happen on-orbit, would threaten success of the mission or present a hazard. • Any in-flight anomalies from the ISS, including a description of the anomaly and the rationale for closure. · Any in-flight anomalies from previous Space Shuttle missions that may be considered to be constraints to flight, including description of actions being taken.
Hazard Analysis	• Status of any open ISS hazards and the estimated date of closure. • Status of Space Shuttle hazards that represent a unique risk or any new accepted risk hazards. • A table that describes the background and acceptance rationale on any ISS mission-related safety noncompliance. · A summary of any significant quantitative assessment results.
Independent Assessment	• A summary of the Independent Assurance activities, identifying any open issues, and including background and description of actions being taken. · A summary of assessments performed which address the long-term safety and mission success of the program.
Launch Commit Criteria (LCC)	• Any LCC changes considered to be potential constraints, including background and description of actions being taken.

Data Reporting Element	Reporting Element Definition
Launch Package & On-Orbit Configuration Description & Status	· The configuration of each element to be launched, including the flight support equipment, payloads, Design Test Objective (DTO's), and cargo. · The configuration of the on-orbit vehicle before and after the mission, and the readiness status of the described items and the on-orbit configuration.
Lessons Learned Review	· Any applicable items from the ISS Lesson Learned Database that remain to be addressed, including background and description of actions being taken.
Limited Life Items	• Any limited life hardware that may be considered to be a constraint, including background and description of actions being taken. · An assessment of ISS limited life items to support Initial Launch Capability (ILC) +30 days, and ILC +60 days.
Mission Overview	· A summary of the overall mission and the on-orbit operations to be performed. • A summary of the ISS stage activities. · A description of the additional ISS functionality gained as a result of the mission.
Mission Success Criteria	• The mission objectives, science objectives, and mission success criteria (minimum and full) for the mission. An affirmative statement that risk acceptance decisions made for the mission will not adversely affect future mission success. • The ISS stage success criteria including mission and science objectives. • Any open issues and residual risks in meeting the mission objectives. · A summary of the planned contingencies for the ISS stage.
NASA Safety Reporting System (NSRS) Review	• Status of applicable open NSRS reports and identification of any that are considered to be potential constraints to flight. · Background and description of actions being taken. Note: Details of NSRS reports will not be discussed so as to protect the anonymity of the author.
Other Concerns	• Any other issue or concern not covered elsewhere which may represent a potential constraint, including background and description of actions being taken.
Suspect Condition Alert Notice (SCAN) / Alerts	· Any open alerts considered to be potential constraints, including background and description of actions being taken.
Significant Non-Conforming Parts and Materials	• Any open issues or potential constraints, including background and description of actions being taken.
Software Problem Reports (PR)	• Any open software issues, software PR's, or unexplained anomalies, including background and description of actions being taken.
SMA Life-cycle Activities Overview	· An overview of the ISS SMA activities that were performed in support of the mission, integration into the on-orbit configuration, and the increment operations.

Data Reporting Element	Reporting Element Definition
SMA Metrics Overview	• An overview of potential ISS risks for the on-orbit stage. · Discussion of any ISS subsystem or functional reliability problem areas. (On-orbit Stage Functional SMA Assessment.)
Waivers/Deviations	• Waivers/deviations considered to be potential constraints, including background and description of actions being taken.
One Page Summaries	• A short summary of an issue, concern, or special topic (referred to hereafter as an issue) related to the flight, increment, or expedition under review. A one-page summary (one-pager) can be used to document an issue that is well understood, has been brought to closure, has little or no residual risk, can be easily explained, and has no controversy associated with closure. One-Pagers are used to document issues that were identified late in the assessment process and not covered in one of the other reporting areas (e.g., PR's, Non-Compliance Reports (NCR), etc).

Table C-3 Data Reporting for Individual ISS Launches

Data Reporting Element	Responsible Individual or Office								
	HQ Enterprise SMA	NASA Center SMA				HEDS IA	Astronaut Office	ISS Prime Contractor	Inter-national Partners
		Center SMA	ISS SMA	KSC ISS/ Payloads SMA	KSC SHIA				
Certification		X	X	X				X	X
EVA Readiness		X					X		
FMEA/CIL		X	X	X				X	
Government Surveillance	X	X	X	X	X	X			
Hardware Problems (Including IFAs, PRs)		X	X	X				X	
Hazard Analysis		X	X	X				X	
Independent Assessment	X				X	X			
Launch Commit Criteria			X						X
Launch Package & On-Orbit Configuration Description & Status			X						
Lessons Learned Review		X	X	X				X	
Limited Life Items		X	X					X	
Mission Overview			X						
Mission Success Criteria			X						
NASA Safety Reporting System (NSRS) Review		X	X	X					
Other Concerns		X	X	X	X	X	X	X	X
SCAN / Alerts		X	X	X				X	X
Significant Non-Conforming Parts and Materials		X	X	X				X	X
Software Problem / PRs		X	X	X				X	
SMA Life-cycle Activities Overview			X	X					
SMA Metrics Overview			X						
Waivers/Deviations			X						
One Page Summaries	X	X	X	X	X	X	X	X	X

Table C-4: Data Reporting for Space Shuttle Launches

Data Reporting Element	Responsible Individual or Office					
	HQ Enterprise SMA	NASA Center SMA			HEDS IA	Astronaut Office
		Center SMA	Space Shuttle SMA Manager	KSC SHIA		
Certification		X	X			
EVA Readiness		X				X
FMEA/CIL		X				
Government Surveillance	X	X	X	X	X	
Hardware Problems (Including IFAs, PRs)		X	X			
Hazard Analysis		X	X			
Independent Assessment	X	X		X	X	
Launch Commit Criteria		X	X			
Launch Package & On-Orbit Configuration Description & Status		X				
Lessons Learned Review						
Limited Life Items		X	X			
Mission Overview		X				
Mission Success Criteria		X	X			
NASA Safety Reporting System (NSRS) Review	X	X	X	X		
Other Concerns	X	X	X	X	X	X
SCAN / Alerts		X	X			
Significant Non-Conforming Parts and Materials		X	X			
Software Problem / PRs		X	X			
SMA Life-cycle Activities Overview		X	X			
SMA Metrics Overview						
Waivers/Deviations			X			
One Page Summaries	X	X	X	X	X	X

Table C-5: Data Reporting for Joint Space Shuttle / ISS Launches

Data Reporting Element	Responsible Individual or Office									
	HQ Enterprise SMA	NASA Center In-Line SMA					HEDS IA	Astronaut Office	ISS Prime Center	Inter-national Partners
		Center SMA	Space Shuttle SMA Manager	ISS SMA	KSC ISS SMA	KSC SHIA				
Certification		X	X	X					X	X
EVA Readiness		X						X		
FMEA/CIL		X		X	X				X	
Hardware Problems (Including IFAs, PRs)		X	X	X	X				X	
Hazard Analysis		X	X	X	X				X	
Independent Assessment	X	X				X	X			
Launch Commit Criteria		X	X	X						X
Launch Package & On-Orbit Configuration Description & Status		X		X						
Lessons Learned Review				X	X				X	
Limited Life Items		X	X	X					X	
Mission Overview			X	X						
Mission Success Criteria			X	X						
NASA Safety Reporting System (NSRS) Review	X	X	X	X	X	X				
Other Concerns	X	X	X	X	X	X	X	X	X	X
SCAN / Alerts		X	X	X	X				X	X
Significant Non-Conforming Parts and Materials		X	X	X	X				X	X
Software Problem / PRs		X	X	X	X				X	
SMA Life-cycle Activities Overview				X	X					
SMA Metrics Overview			X	X						
Waivers/Deviations		X	X	X						
One Page Summaries	X	X	X	X	X	X	X	X		

APPENDIX D. SMA Mission Operations

D.1 Mission Management Overview

Following the signing of the Certificate of Flight Readiness (CoFR), and proper closeout of all CoFR exceptions, the Shuttle Mission Management Team (MMT) is activated for each Shuttle Mission. NSTS 07700, Volume VIII, Appendix D, "Space Station Program, Flight Definition and Requirements Directive," provides a detailed description of the Shuttle Program MMT. The Space Shuttle MMT is in operation until the Orbiter has returned to KSC after the flight.

The ISS MMT (IMMT) was established prior to the launch of the first ISS element and will be operate continuously for the life of the ISS program. The IMMT Charter, ISSP-PPD-507, "Partner Program Directive, Charter for International Space Station Mission Management Team" provides a detailed description of the International Space Station IMMT.

The goal for SMA participation on the MMT and IMMT is to provide input and oversight on each issue and the actions required for resolution. The MMT and IMMT ensure that effective coordination is performed with program elements and transportation vehicle organizations, including International Partners (IP's), in order to facilitate timely management decisions in support of real time operations. The MMT and IMMT also interface with the IP launch vehicle/transportation-vehicle program management teams during launch countdown, launch, rendezvous, docking, and mated operations. The MMT and IMMT have the authority to make decisions regarding the real-time operations.

For problems or issues that are outside the scope of the approved flight procedures and flight rules and for which time is available, the problem is taken to the MMT and/or IMMT for resolution. The MMT provides programmatic oversight and direction during real-time operations. The MMT and IMMT are routinely provided with the status of mission activities and plans. The MMT and IMMT are responsible for making decisions that affect the current flight and increment.

D.2 Purpose

This appendix defines the SMA community's participation in the real-time mission support activities of the MMT and the IMMT. This Appendix applies specifically to NASA Headquarters OSMA personnel, wherever located, and to Center and Program SMA personnel providing Agency level to support to the Space Shuttle and ISS Programs.

D.3 MMT/IMMT Roles and Responsibilities

D.3.1 Associate Administrator for Safety and Mission Assurance

The Associate Administrator for Safety and Mission Assurance is responsible for:

a. Designation or approval of the SMA members to both the MMT and IMMT.

b. Maintaining an oversight of the SSP and ISS Programs during the launch countdown, flight, on-orbit and recovery activities through the MMT and IMMT.

D.3.2 SMA Member of the Space Shuttle MMT

The Space Shuttle MMT SMA member is responsible for:

a. Representing the SMA community at the daily MMT telecon and providing the single SMA position as required.

b. Identifying and dealing with, on a real-time basis, issues identified during the course of the mission and elevating them to the appropriate level of SMA management as soon as practical. Upon notification, and at the discretion of the Associate Administrator for Safety and Mission Assurance, a meeting with the appropriate NASA and contractor SMA management is convened.

c. Integrating the results of the HEDS SMA meeting back into the program during the MMT meetings.

D.3.3 SMA Member of the International Space Station IMMT

The International Space Station IMMT SMA member is responsible for:

a. Representing the SMA community at the IMMT meetings and telecons and providing the single SMA position as required. The IMMT meets each day during joint missions and twice a week during the quiescent on-orbit operations stage. The IMMT meets, in both cases, to address the status of flight anomalies, flight operations, and any mission-related actions/activities.

b. Providing programmatic SMA oversight and direction during real-time operations of the ISS of the IMMT.

c. Providing SMA management with flight status and activity briefings. The SMA IMMT member provides ISS SMA management with verbal prebriefing coupled with the information obtained in the pre-IMMT meeting to ensure activities and potential safety-of-flight (SoF) concerns are accurately communicated.

d. Collecting of ISS SMA management concerns for presentation to the IMMT.

e. Serving as the SMA member to the Space Station Control Board for time-critical items when ISS SMA Management is not available.

D.4 Mission Management

Following the formal FRR, the SMA community focuses its attention to the completion of the planned open work, proper closeout of any CoFR exceptions identified at the FRR, and any non-standard activities within their assigned area of responsibility. In preparation for launch, mission execution, and recovery, the Mission Management Team (MMT) is activated at the Pre-launch MT (PMMT) Review to initially assess deltas to flight readiness since the FRR and to provide a go/no-go

determination to continue the countdown. The Associate Administrator for Safety and Mission Assurance designates or approves the SMA MMT member for both the Space Shuttle launch countdown and for HSF activities.

D.4.1 Space Shuttle Prelaunch MMT Activities

D.4.1.1 Space Shuttle Prelaunch MMT membership is delineated in NSTS 07700, Volume VIII, Appendix D. With the activation of the MMT, the SMA MMT member becomes the focal point for the SMA community and is responsible for monitoring and, if requested, coordinating the evaluation of anomalies, issues, and concerns raised since the FRR. The SMA MMT member presents the Associate Administrator for Safety and Mission Assurance position on potential issues and concerns at the PMMT Review. After the PMMT Review, the SMA MMT member maintains contact with key SMA personnel designated to support the launch and mission execution through the Prelaunch Communications Network System, which is administered by the JSC Safety, Reliability, and Quality Assurance Office. During the terminal launch countdown (T-6 hours to launch), the SMA MMT member will present the SMA community position to the MMT Chairperson and will provide the OSMA go/no-go for launch at the T-9 minute MMT poll. The SMA MMT member bases the go/no-go for launch position on a poll taken of various NASA in-line SMA and Independent Assurance organizations. More importantly, the OSMA MMT membership provides an alternate independent path for all to communicate information and actions concerning safety, risks, and other SMA matters to NASA Senior Management (as required by NPD 8700.1, "NASA Safety and Mission Success").

D.4.1.2 The SMA MMT member coordinates disposition of anomalies, issues, and concerns throughout the launch countdown and polls the following in-line SMA and Independent Assurance organizations to arrive at the SMA community go/no-go for launch:

Table D-1: SMA Organizations

KSC Shuttle Processing In-Line SMA
JSC In-Line SMA
MSFC In-Line SMA
KSC ISS/Payload Processing
KSC Safety, Health and Independent Assessment (SHIA)
Manager, SSP SMA
Manager, ISS SMA (For ISS mission only)
Headquarters, Enterprise Safety and Mission Assurance Division

D.4.1.3 An SMA MMT poll is conducted on the SRM&QA communications loop (OIS Channel 6006) to determine the OSMA position on an anomaly, issue, or concern. Each organizational entity to be polled resides at the appropriate location to meet their individual responsibilities; all do not need to be at the launch site as long as two-way access to the SRM&QA communications loop is available. Each HSF SMA and Independent Assurance organization has assigned duties with their respective organizational entity and is responsible for supporting anomaly, issue, and concern resolution on their respective home organization OIS communications channel. Through this activity, each in-line SMA and Independent Assurance organization is responsible for communicating with their respective contractor SMA organizations during the countdown to determine the contractor SMA position on

anomaly, issue, and concern resolution and their go/no-go for launch. The contractor SMA position is reflected in the NASA SMA community poll conducted by the SMA MMT member.

D.4.2 International Space Station MMT (IMMT) Activities

The ISS MMT roles, responsibilities, and membership are defined in ISS Partner Program Directive ISS-PPD-507, "Charter for the International Space Station Mission Management Team." The ISS SMA MMT member, as the OSMA designee, is the focal point for the SMA community and is responsible for coordinating the evaluation of anomalies, issues, and concerns associated with the orbiting ISS. The SMA IMMT member presents the results of SMA evaluations to the IMMT chairperson. The SMA IMMT member provides a single SMA go/no-go for any polling decisions made by the IMMT chair. The SMA IMMT member bases his/her decision on a poll of NASA SMA; ISS prime contractor SMA, ISS Mission Evaluation Room (MER) SMA support, and the HEDS Independent Safety and Mission Assurance organization.

D.4.3 Launch, and On-orbit Operations Through Retrieval Overview:

D.4.3.1 Following launch and throughout the mission, the SMA MMT member (Space Shuttle and/or ISS) continues the SMA community coordination activities associated with evaluation of anomalies, issues, and concerns. The Space Shuttle SMA MMT member represents the OSMA and SMA community at the daily MMT telecon (joint MMT for ISS Missions) and provides the single SMA position as required. Issues identified during the course of the mission are dealt with on a real-time basis and elevated to the appropriate level of SMA management as soon as practical. Figure D 1 depicts the notification of proper authorities at the program, NASA Center and NASA HQ levels. Upon notification, and at the discretion of the Associate Administrator for Safety and Mission Assurance, a meeting with the appropriate NASA and contractor SMA management is convened. The Enterprise Safety and Mission Assurance Division is the focal point for coordination of the meeting with the participants.

D.4.3.2 In the event of a contingency, the applicable Contingency Action Plans (CAP) are implemented (see Appendix D.6). SSP 50190, "International Space Station Contingency Action Plan," details the reporting responsibility for ISS. Each CAP notification/reaction sequence includes notification of SMA personnel and OSMA. The Associate Administrator for Safety and Mission Assurance determines the manner of real-time support actions in the event of an Office of Space Flight probable or declared contingency. This determination will be made in concert with NASA Headquarters HOWI 8700-Q034, "Establish and Manage OSMA Operations Contingency Action Center" (See Figure D-2).

D.5 SMA Support to the Mission Evaluation Room

The Mission Evaluation Rooms (MER) for the Space Shuttle and Space Station Programs are responsible for continuous monitoring of both the Space Shuttle and the ISS and the crews. The Space Station real time operations activities are defined in SSP 50190, "International Space Station Program Contingency Action Plan for JSC". ISS SMA real-time operational activities are managed in accordance with SSP 50200-09, Volume IX, section 12.0, "Safety and Mission Assurance/Program Risk."

SMA personnel from SMA offices supporting the Space Shuttle and ISS provide technical support to mission management during potential and declared contingencies. SMA shall support any immediate actions taken shall be taken to prevent loss of life, equipment and property.

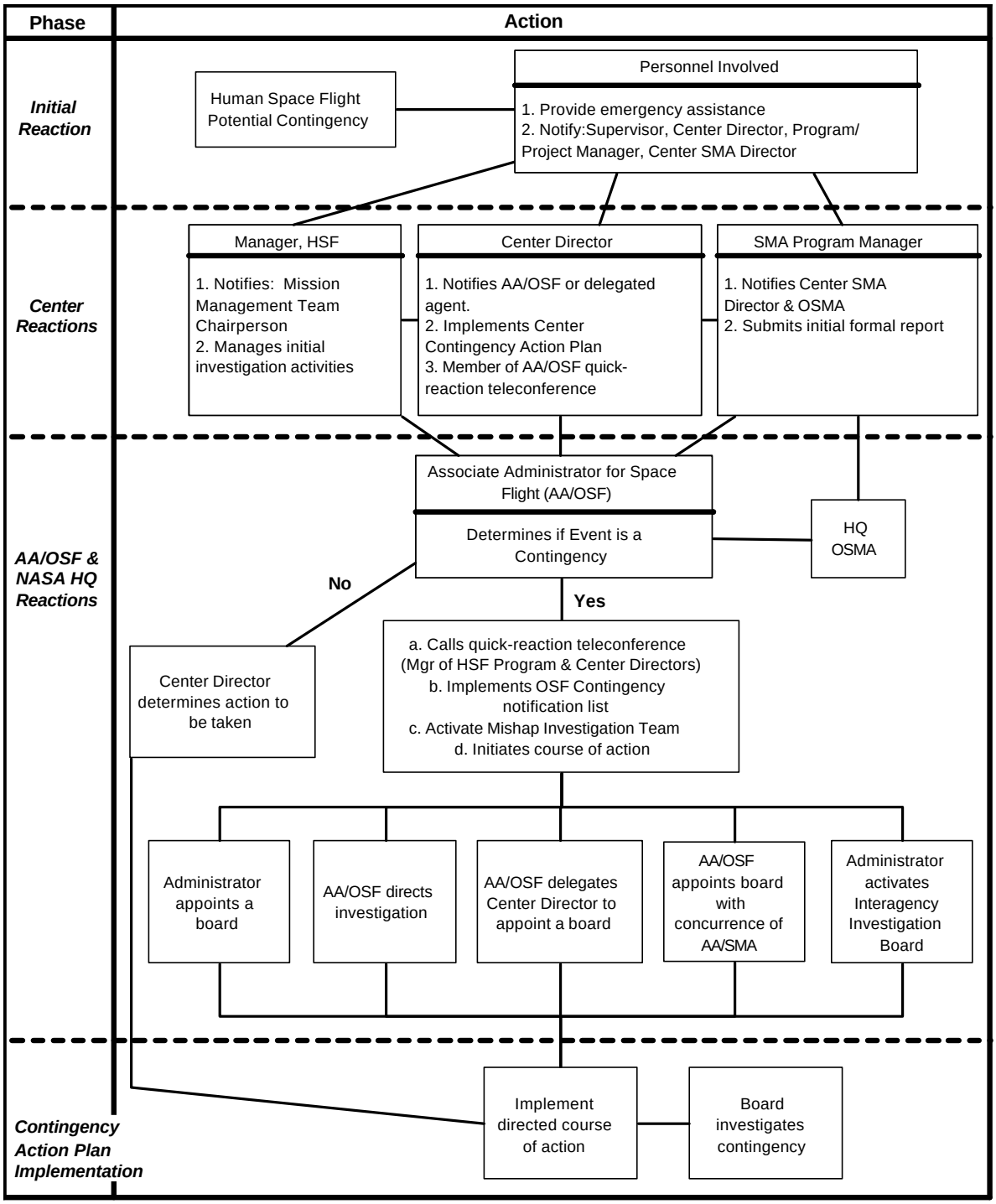

Figure D-1: Notification

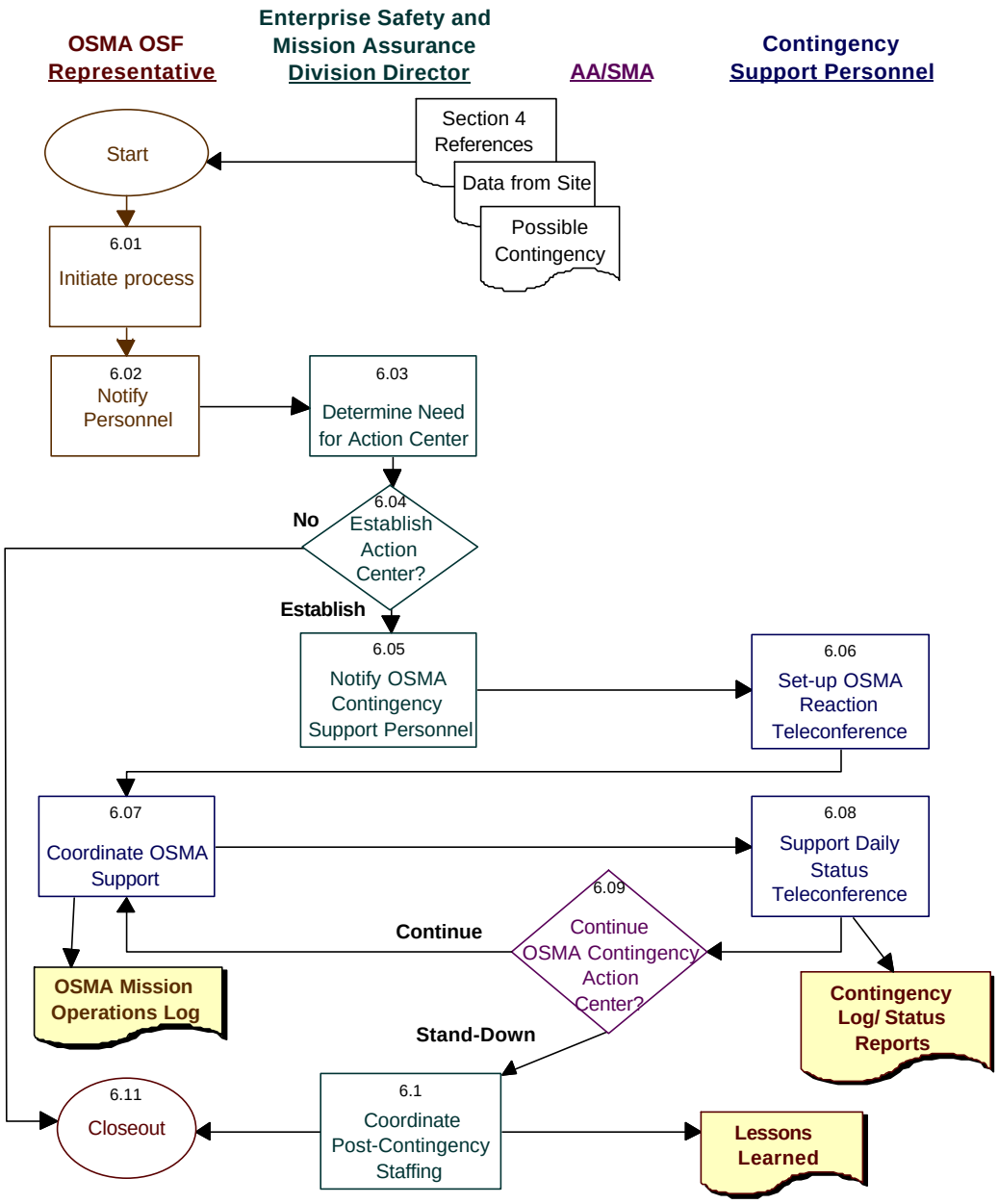

Figure D-2: NASA OSMA Notification

(From NASA HQ Office Work Instruction 8700-Q034, "Manage Emergency Operations Center (Shuttle)."

D.6 Contingency Operations

D.6.1 SSP 50190, "International Space Station Program Contingency Action Plan for JSC" defines the procedural flow for implementing Contingency Action Plans and establishing investigating teams and boards at the various levels of the program and Agency. In the event of a potential ISS contingency, the formal communications begins with the JSC Director notifying the Associate

Administrator for Space Flight within 60 minutes. There are many parallel paths of communications, especially during times of potential life-threatening situations.

D.6.2 NSTS 07700, Volume VIII, Appendix R, "Space Station Program, Flight Definition and Requirements Directive," describes the integrated plan to predetermine the program response in the event of a Space Shuttle contingency.

D.6.3 NASA Headquarters Contingency Operations. The ISS SMA Manager will immediately notify the NASA Headquarters Director, Enterprise Safety and Mission Assurance Division. The notification shall include a description of the potential contingency; its cause, if known; associated information leading up to the potential contingency; any actions that have been initiated or are planned; and recommendations for a course of action. Based on this information the Director of OSMA Enterprise Safety and Mission Assurance Division determines the need for implementation of the Headquarters Office Work Instruction (HOWI 8715-Q034), "Establishing and Managing of OSMA Flight Operations Contingency Action Center."

APPENDIX E. Special SMA Interfaces

E.1 Use of Radioactive Materials in Space

E.1.1 In accordance with NPG 8715.3, "NASA Safety Manual," all programs and projects are required to obtain nuclear safety launch approval (NLSA) before placing any nuclear materials into space. Chapter 5 of NPG 8715.3 describes in detail the process for notification of the intent to launch radioactive materials in to space and granting of NLSA in accordance with PD/NSC-25. The NASA Nuclear Flight Safety Assurance Manager (NFSAM) within the OSMA is tasked to provide support to the programs and the NASA SMA community.

E.1.2 For spacecraft that remain on-orbit, such as the ISS or Hubble Space Telescope, the NFSAM maintains a listing of all radioactive materials on the spacecraft.

E.1.3 Chapter 5 of NPG 8715.3 also requires that appropriate contingency planning be in place for any operations involving radioactive materials in space. The NFSAM will provide assistance in development of programmatic and NASA-wide plans.

E.2 Classified Payloads

For payloads and operations classified as national security items onboard the Space Shuttle and/or the ISS, OSMA Enterprise Safety and Mission Assurance Division provides assistance as needed.